

INEQUALITY OF THE LOWER EXTREMITIES FOLLOWING FRACTURE OF THE SHAFT OF THE FEMUR IN CHILDREN

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THE treatment of fracture of the shaft of the femur in children presents a variety of problems based upon a consideration of conditions peculiar to children themselves, as well as the peculiarities of the fracture. In determining upon the adequacy of a certain method of treatment in a given case it is customary to make such assumptions as that union will take place or that callus formation will be sufficiently abundant to fill such spaces between fragments as in the adult might mean non-union. While the existence of a strong tendency to union and to generous callus formation is commonly appreciated, it is not so commonly appreciated that fracture of the shaft of the femur in children frequently, perhaps commonly, causes stimulation of the growth of the injured bone. In reviewing the final outcome following this injury in children in a series of cases two interesting facts have presented themselves. First, that permanent shortening of the involved extremity was obviously less frequent than following similar injuries in adults, even where at the termination of treatment shortening had existed; second, that it was not uncommon to find some degree of lengthening of the injured leg; this, too, where shortening had existed originally. In fact, excessive lengthening was more common than excessive shortening, and while an undesirable amount of overriding had been modified or corrected by treatment when necessary, there had been no provision included in the usual methods of treatment to prevent or limit excessive elongation of the broken bone with corresponding lengthening of the affected extremity.

A brief description of five cases possessing this lengthening is presented herewith.

CASE I.—A. P., age nine. Injured August 25, 1918. A fracture of the shaft of the left femur near its centre. Line of fracture irregularly transverse. There was two inches overriding. Under anæsthesia an end-to-end reduction of the fracture was accomplished, apposition being imperfect but satisfactory, and a plaster spica dressing applied. Frequent X-ray examinations indicated that the engagement of the fragments was maintained. There was slight settling upward of the lower fragment, due to absorption under pressure of bony irregularities at point of contact of fragments. At the time of discharge from the hospital, six weeks after injury, one-half inch shortening of the extremity was noted. Two years and two months after injury the affected extremity was found to be three-eighths of an inch long. In the standing position there was obvious tilting upward of the pelvis on this side. There were no symptoms complained of that might be attributed to the injury; no disability.

CASE II.—H. E., age fourteen. Injured September 27, 1920. A fracture of the shaft of the left femur just above its centre. Line of fracture of the long

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oblique variety, with one-half inch overriding. Under anaesthesia reduction was attempted and a plaster spica dressing applied. One week after injury there was marked increase in the overriding, the extremity shortened one and one-half inches. Edmonton tongs with traction applied, the overriding reduced to one-half inch. Two months after injury there was one-half inch lengthening of the affected extremity, which at ten months (July, 1921) had increased to one inch.

CASE III.—C. K., age five. Injured March 23, 1915. A fracture of the shaft of the left femur, just above its centre. The X-ray revealed a comminuted fracture, line of fracture of the long oblique variety, and a large third fragment present. There was marked displacement with overriding. On the eighth day after injury a Steinmann pin was inserted through the condyles of the femur to correct seven-eighths of an inch shortening. Discharged from hospital eight weeks after injury, the extremity one-quarter of an inch short. One year and nine months, and again five years and ten months after injury, one-half inch lengthening was observed.

CASE IV.—P. G., age eleven. Injured December 5, 1918. Fracture of the shaft of the left femur in its lower third. Line of fracture practically transverse with two inches overriding. Two attempts under anaesthesia failed to improve displacement of fragments. A Lane plate was applied on the twelfth day after injury. To obtain reduction and favor end-to-end contact a small portion of bone was removed from the end of one fragment. Discharged from hospital nine weeks after injury, the affected extremity three-eighths of an inch short. Two years and one month after injury the extremity found one inch long. Marked tilting upward of pelvis upon same side in the standing position. Lane plate still present and well tolerated.

CASE V.—V. B., age eight. Injured May 26, 1911. A fracture of the shaft of the left femur in its upper third. Line of fracture practically transverse, just below the lesser trochanter. Excessive angular deformity, lower end of upper fragment presenting just beneath skin. Other methods failing to bring about satisfactory reduction, a Lane plate was applied on the fourteenth day. Small portion of bone removed from lower end of upper fragment to secure reduction and satisfactory apposition. Three months after injury affected extremity noted one-half inch short. Fifteen months after injury one-half inch lengthening observed. Observation seven years after injury and again nine years and a half after injury, showed three-fourths of an inch lengthening of the injured extremity. Lane plate still present and well tolerated.

Apparently the situation of the fracture is irrelevant in its relationship to the stimulation of bone growth, since overgrowth has been as great in fractures of the upper, middle and lower thirds of the femoral shaft. Nor was the epiphysial cartilage directly involved in any case. Lengthening may occur whether the method of treatment be by simple reduction, the employment of the pin or the tongs, or the application of a Lane plate, and to an equal degree. In four of the five cases there was shortening of the extremity at the termination of treatment, while in two there had been actual removal of bone from the ends of the fragments. In none had overriding been over-corrected or even fully corrected. While the growth of the fractured bone may be accelerated following its injury, there is apparently no compensatory activity, either early or late, upon the opposite side, and an inequality produced under these circumstances is seen to persist after ten years. Evidently the possibility of excessive growth of a fractured femur during the

period of childhood is of sufficient importance to deserve some consideration in the application of treatment to this injury. An extremity one inch short at the termination of treatment would generally be considered a poor result. So far as the patient is concerned it is immaterial whether the inequality of the extremities be due to shortening or lengthening. Even with the tilting of the pelvis and the slight compensatory curvature of the spine there was noted a remarkable freedom from all symptoms and an absence of disability of every sort. Moderate degrees of shortening of the extremity, due to overriding of the fragments, in cases of fracture of the shaft of the femur in children is evidently of less significance than in corresponding injuries in adults, and the possibility of post-traumatic acceleration of growth of this bone in children should be kept in mind in passing judgment upon the efficiency of a particular method of treatment and particularly when some radical procedure is contemplated for the correction of overriding.